IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant: Daniel D. McNeil

Assignee: Mirapoint, Inc.

Title: METHOD AND SYSTEM FOR PROVIDING IMAGE INCREMENTAL AND DISASTER RECOVERY

Serial No.: 10/066,109 File Date: January 31, 2002

Examiner: Thuy N. Pardo Art Unit: 2165

Docket No.: MPT-006

Date: May 7, 2007

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

This Appeal Brief is in support of the Notice of Appeal filed May 4, 2007.

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INDEX

I. REAL PARTY IN INTEREST

The real party in interest is the assignee, Mirapoint, Inc., pursuant to the Assignment recorded in the U.S. Patent and Trademark Office on January 31, 2002 on Reel 012576, Frame 0557.

II. RELATED APPEALS AND INTERFERENCES

Based on information and belief, there are no other appeals or interferences that could directly affect or be directly affected by or have a bearing on the decision by the Board of Patent Appeals in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-24 are pending. Claims 1-24 stand rejected.

In the present paper, rejected Claims 1-24 are appealed.

Pending Claims 1-24 are listed in Appendix A.

IV. STATUS OF AMENDMENTS

All claim amendments have been entered.

V. SUMMARY OF THE INVENTION

Figures 1A and 1B are shown below to facilitate understanding of Appellant's invention. As taught by Appellant in the Specification, paragraphs [0007] - [0011]:

> [0007] A method for backing up data in a computer system from at least one primary data source to a secondary data source is provided. The method includes performing a full image backup on a plurality of data blocks stored by the primary data source(s). An incremental backup can then be initiated at a predetermined interval. During this incremental backup, the modification time of each file and folder is examined. If the modification time is earlier than the defined time, then the data block used by that file/folder is added to an unused data block list. All files/folders are examined in a

similar manner. All blocks, except those data blocks in the unused list, can then be written to tape with their file system metadata.

[0008] Another method to accomplish this image incremental backup, is to examine the modification time of each file and folder, and list all data blocks associated with the files/folders whose modification time is later than the defined time in the incremental backup. All files/folders are examined in a similar manner. All blocks on the used list can then be written to tape with their file system metadata.

[0009] In either approach, this method creates an image incremental backup that includes the file system metadata and all data from files/folders that have changed since the last backup. The data is written in disk order and, because it does not contain data from files/folders that have not changed, the amount of data and the time it takes to write the data to tape is much smaller than a full image backup.

[0010] In one embodiment, the defined time is a time when the full image backup was performed. In another embodiment, the defined time is a time when a last incremental backup was performed. In yet another embodiment, the defined time is either a first time when the full image backup was performed or a second time when a last incremental backup was performed, whichever is the most recent.

[0011] Because file systems, by design, already track each file/folder's modification time, this metadata is available and can be tracked without any additional overhead during normal operation. Checking modification times only during the incremental backup eliminates the significant overhead associated with tracking blocks that change during normal operation.

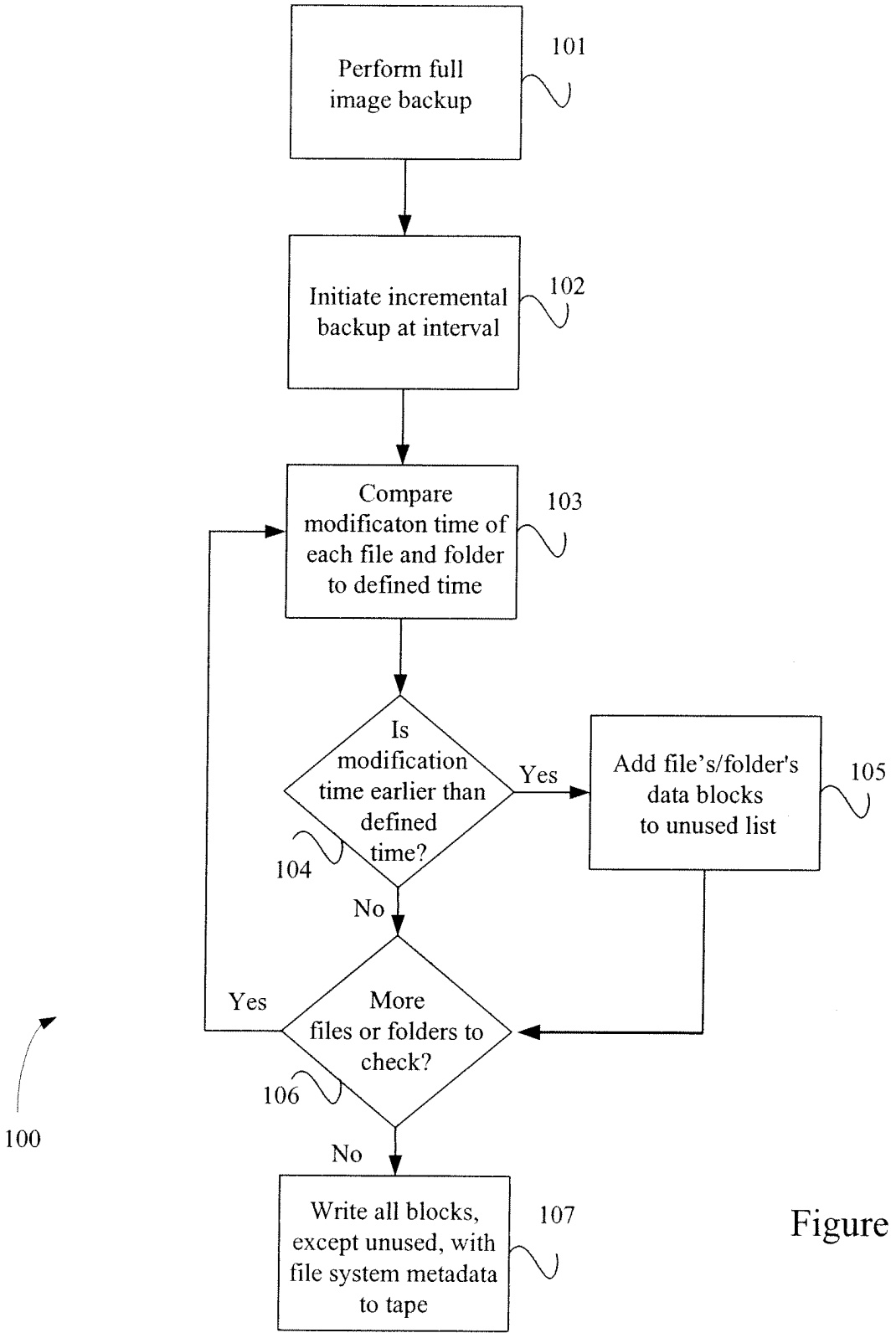

Perform full image backup
101
Initiate incremental backup at interval
102
Compare modificaton time of each file and folder to defined time
103
Is modification time earlier than defined time?
104
Yes
Add file's/folder's data blocks to unused list
105
No
More files or folders to check?
106
Yes
No
Write all blocks, except unused, with file system metadata to tape
107
100

Figure 1A

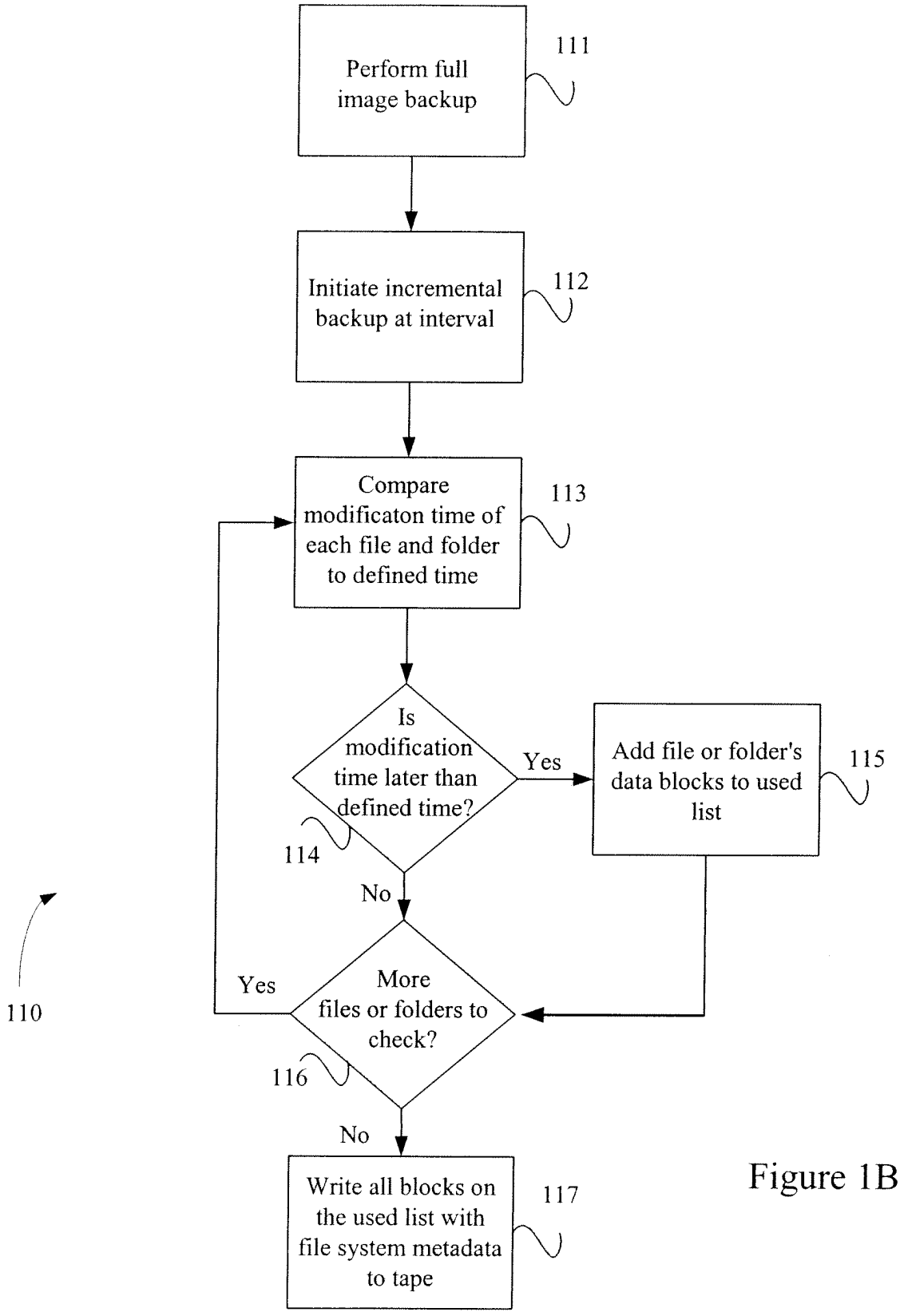

Perform full image backup
111
Initiate incremental backup at interval
112
Compare modificaton time of each file and folder to defined time
113
Is modification time later than defined time?
114
Yes
Add file or folder's data blocks to used list
115
No
More files or folders to check?
116
Yes
No
Write all blocks on the used list with file system metadata to tape
117
110

Figure 1B

As further taught by Appellant in the Specification, paragraphs [0022] - [0024]:

> [0022] Advantageously, because both of these image incremental backups include the file system metadata as well as the files and folders that have changed, all file system changes can be reflected in the backup. Specifically, all files and folders that are new, changed, removed, renamed, and linked are reflected in the image incremental backup.
>
> [0023] Therefore, of importance, including file system metadata in the backup significantly increases the accuracy of the backup compared to a standard file-by-file backup, which only identifies new/changed files. Moreover, because an image backup writes data in disk order, not file order, this backup is faster than a standard file-by-file backup. Finally, because each file's/folder's modification time is already part of the file system metadata being tracked and updated by the file system, this backup method has no associated overhead during normal operation.
>
> [0024] Advantageously, because an image incremental backup includes all file system metadata, this image incremental backup along with the last full image backup can be used to restore a system to the point in time of the last backup in the event of a disaster. Thus, image incremental backups along with the last full image provide an effective and efficient disaster recovery mechanism.

A concise explanation of the subject matter defined in each of the independent claims involved in the appeal (i.e. Claims 1 and 13) and any dependent claims argued separately (i.e. Claims 5 and 6) is provided below. This concise explanation refers to the specification by paragraph, page, and line numbers, and to the drawings, if any, by reference numbers/characters.

1. A method for backing up data in a computer system from at least one primary data source to a secondary data source **(Figure 1A: 100)**, the method comprising:

performing a full image backup in disk order on a plurality of data blocks stored by the at least one primary data source **(Figure 1A: 101; Specification: paragraph 0018, page 5, lines 23-24)**;

initiating an incremental backup at a predetermined interval, the incremental backup including file system metadata **(Figure 1A: 102; Specification: paragraph 0018, page 5, lines 24-25)**; and

comparing a modification time of each file/folder at the predetermined interval to a defined time, the file system metadata including each modification time **(Figure 1A: 103; Specification: paragraph 0020, page 6, lines 1-10, paragraph 0023, page 7, lines 19-23)**, wherein if the modification time is earlier than the defined time **(Figure 1A: 104; Specification, paragraph 0020, page 6, lines 10-11)**, then excluding data blocks of that file/folder from the incremental backup **(Figure 1A: 105, 107; Specification: paragraph 0020, page 6, lines 12-24)**.

5. The method of Claim 1, further including determining whether a system clock has been changed **(Figure 2A: 201; Specification, paragraph 0026, page 8, lines 8-12; Figure 2B: 202: Specification, paragraph 0026, page 8, lines 15-20)**.

6. The method of Claim 5, wherein if the system clock has been changed, then returning to performing the full image backup on the plurality of data blocks **(Figure 2A: 101/111; Specification, paragraph 0026, page 8, lines 12-13; Figure 2B: 101/111: Specification, paragraph 0026, page 8, lines 20-21)**.

13. A method for backing up data in a computer system from at least one primary data source to a secondary data source **(Figure 1B: 110)**, the method comprising:

performing a full image backup in disk order on a plurality of data blocks stored by the at least one primary data source **(Figure 1B: 111; Specification: paragraph 0021, page 6, lines 26-27)**;

initiating an incremental backup at a predetermined interval, the incremental backup including file system metadata **(Figure 1B: 112; Specification: paragraph 0020, page 6, lines 27-28)**; and

comparing a modification time of each file/folder at the predetermined interval to a defined time, the file system metadata including each modification time **(Figure 1B: 113; Specification: paragraph 0020, page 6, lines 28-30, paragraph 0023, page 7, lines 19-23)**, wherein if the modification time is later than the defined time **(Figure 1B: 114; Specification: paragraph 0020, page 6, lines 30-32)**, then including data blocks of that file/folder in the incremental backup **(Figure 1B: 115, 117; Specification: paragraph 0020, page 6, line 32 to page 7, line 7)**.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following issues are presented to the Board of Appeals for decision:

(A) Whether Claims 1-24 are patentable under 35 U.S.C. 103(a) over EP Application 0410630 A2 (Myers) in view of U.S. Patent 6,038,569 (Beavin).

VII. ARGUMENTS

(A) Claims 1, 9-13, and 21-24 are patentable under 35 U.S.C. 103(a) over EP Application 0410630 A2 (Myers) in view of U.S. Patent 6,038,569 (Beavin).

1. Myers Overview

Myers teaches a modified INCREMENTAL backup in which only new and changed data since the last backup will be copied. Page 7, lines 37-39. This backup uses a pair of adjustable parameters: MBF is the minimum period between backups for a data set and GBF is the maximum period between backups of a data set in the larger storage group. Page 7, lines 39-41. A data set is eligible for backup if either: (1) the date of the last update lies between an instant date and the date of the last backup, and the difference between the instant date and the date of the last backup equals or exceeds the MBF, or (2) the difference between the instant date and the date of the last backup equals or exceeds the GBF. Page 7, lines 42-45. According to Myers, this modified INCREMENTAL backup advantageously reduces the backup data produced compared to a hybrid FULL/INCREMENTAL backup (e.g. 19% to 22% less backup data). Page 6, lines 16-32 referring to Fig. 1.

2. Beavin Overview

Beavin teaches concurrently loading a data structure and creating a full image copy (i.e. a backup). Col. 4, lines 40-43. In this method, a load processor organizes data records into pages. Col. 4, lines 50-52. As each page is written to a primary data structure, the load processor also writes a copy of the page to an image copy data set. Col. 4, line 66 to col. 5, line 5. The load processor assigns the same timestamp to the current page and its image copy page. Col. 4, lines 6-11. According to Beavin, when recovering from a data structure failure, each page of the image

copy is sequentially reviewed. Col. 2, lines 46-48. For each image page being reviewed, the page's timestamp is compared with the timestamp of the corresponding page from the primary data structure. Col. 2, lines 48-50. The page is copied from the image copy data set to the primary data structure only if the timestamp comparison indicates that the image copy is more recent than the primary table page. Col. 2, lines 50-54.

3. Limitations recited in Claims 1-24 are not taught, either individually or in combination, by Myers or Beavin

Claim 1 Remarks

Claim 1 recites:

> performing a full image backup in disk order on a plurality of data blocks stored by the at least one primary data source;
> initiating an incremental backup at a predetermined interval, the incremental backup including file system metadata; and
> comparing a modification time of each file/folder at the predetermined interval to a defined time, the file system metadata including each modification time, wherein if the modification time is earlier than the defined time, then excluding data blocks of that file/folder from the incremental backup.

Myers fails to teach multiple limitations of Claim 1. For example, Myers fails to teach a full image backup. Instead, Myers teaches a modified INCREMENTAL backup policy. Page 7, lines 37-39. Myers explicitly distinguishes his modified INCREMENTAL backup policy from either a FULL VOLUME backup or a COMBINATION backup where FULL VOLUME backup is periodically invoked and INCREMENTAL backup invoked therebetween. Page 8, lines 45-48 ("said INCREMENTAL policy being in contradistinction to either FULL VOLUME backup where all data whether or not changed since the last backup will in turn be elsewhere copied,

or COMBINATION backup where FULL VOLUME backup is periodically invoked and INCREMENTAL backup invoked therebetween.") Myers further teaches that a COMBINATION (also called MIXED) backup policy "still results in a spreadout of the backup volumes and more time than an INCREMENTAL policy alone would take." Page 3, lines 29-30. As a result, an explicit objective of Myers is to devise a backup method "in which less data and a smaller backup interval are involved other than that used with prior art FULL, INCREMENTAL, or MIXED backup policies." Page 3, lines 31-33. Thus, Appellant submits that Myers not only distinguishes his modified INCREMENTAL backup method from FULL and COMBINATION backup methods, Myers also explicitly teaches away from FULL and COMBINATION backup methods. Therefore, Appellant respectfully submits that Myers fails to disclose or suggest performing a full backup, much less a full image backup, as recited in Claim 1.

Myers also fails to disclose or suggest an incremental backup that includes file system metadata, which in turn includes the modification time of each file/folder. In contrast, Myers teaches arranging data sets in logically independent groups, each group being assigned a first time interval, wherein a digital computer amends each data set with a date time stamp denoting the dates of the last backup and the last update. Page 3, lines 34-38.

This type of incremental backup is discussed by Appellant as prior art. Specifically, as described in paragraph [0005],

> In systems that want to provide image incremental backups, the additional software to track changes must be enabled. This software, at a minimum, must track which portion of the file system or storage has been re-written. This usually involves updating a map or a list tracking which blocks have been re-written. Thus, all write operations now require at least two writes: one write to update the change list

> or map and another write to write the data. Therefore, this method adds 100% overhead for writes on systems wanting to enable image incremental backups.

Note that a map update involves a map-to-map comparison, thereby adding considerable complexity and time to the update process. Myers shows such a map on page 6, lines 45-56. Appellant's technique advantageously eliminates the additional complexity and overhead of tracking backup dates for each data set, as taught by Meyers.

Specifically, because each file's/folder's modification time is already part of the file system metadata, this backup method has no associated overhead during normal operation. Moreover, as described by Appellant in paragraph [0023], including file system metadata in the backup significantly increases the accuracy of the backup compared to a standard file-by-file backup, which only identifies new/changed files.

Beavin fails to remedy the numerous deficiencies of Myers with respect to Claim 1. Specifically, Beavin teaches associating each data record of a primary data structure with one of multiple pages. Col. 2, lines 31-33. Concurrently, with the storage of each page being written to the primary data structure, each page is also copied to an image copy data set. Col. 2, lines 35-37. Beavin further teaches providing a timestamp for each page when it is written to the primary data structure as well as the image copy data set. Col. 2, lines 42-46.

Appellant respectfully submits that the pages of the image copy data set have nothing to do with the recited full image backup recited in Claim 1. Specifically, in an image backup, the data image is read sequentially from the primary data source and written to the secondary data source. See, for example, the

Specification, paragraph [0004]. Associating each data record with one of multiple pages, as taught by Beavin, is not performed in a full image backup. (For additional support, please see section 4 below.)

Beavin also fails to disclose or suggest an incremental backup that includes file system metadata, which in turn includes the modification time of each file/folder. In fact, Beavin teach nothing about metadata and therefore cannot teach anything about the recited modification time.

Beavin teaches tracking pages being written to both the primary data source and the image copy data set using timestamps that are assigned by processor. Notably, Appellant's technique eliminates the need for these timestamps as well as for tracking pages. Specifically, in Appellant's technique, a backup copy is written only when the backup is performed and existing file system metadata (which already includes the timestamps) is used to determine what should be included in the backup.

Because the cited references fail to disclose or suggest multiple limitations recited in Claim 1, Appellant requests reconsideration and withdrawal of the rejection of Claim 1.

Claims 2-12 Remarks

Claims 2-12 depend from Claim 1 and therefore are patentable for at least the reasons presented for Claim 1. Based on those reasons, Appellant requests reconsideration and withdrawal of the rejection of Claims 2-12.

Claim 5 Remarks

Appellant notes that Claim 5 recites a limitation regarding changing a system clock. The Second Office Action cites Myers at page 5, line 47 to page 6, line 6 as disclosing this limitation. Appellant traverses this characterization.

Specifically, Myers teaches only the times/dates of the last change and last backup for the data objects in this passage. These times/dates have nothing to do with changing a system clock, as recited in Claim 5. Therefore, Appellant requests further reconsideration and withdrawal of the rejection of Claim 5.

Claim 6 Remarks

Appellant notes that Claim 6 recites a limitation regarding changing a system clock. The Second Office Action cites Myers at page 5, line 47 to page 6, line 6 as disclosing this limitation. Appellant traverses this characterization. Specifically, Myers teaches only the times/dates of the last change and last backup for the data objects in this passage. These times/dates have nothing to do with changing a system clock, as recited in Claim 6. Therefore, Appellant requests further reconsideration and withdrawal of the rejection of Claim 6.

Claim 13 Remarks

Claim 13 recites:

> performing a full image backup in disk order on a plurality of data blocks stored by the at least one primary data source;
>
> initiating an incremental backup at a predetermined interval, the incremental backup including file system metadata; and
>
> comparing a modification time of each file/folder at the predetermined interval to a defined time, the file system metadata including each modification time, wherein if the modification time is later than the defined time, then including data blocks of that file/folder in the incremental backup.

Therefore, Claim 13 is patentable for substantially the same reasons presented for Claim 1. Based on those reasons,

Appellant requests reconsideration and withdrawal of the rejection of Claim 13.

Claims 14-24 Remarks

Claims 14-24 depend from Claim 13 and therefore are patentable for at least the reasons presented for Claim 13. Based on those reasons, Appellant requests reconsideration and withdrawal of the rejection of Claims 14-24.

4. Distinguishing Between Full Image Backup And Backing Up Of Files

The Second Final Office Action states that a full image backup has the same functionality of fully file backing up and recovery and therefore Beavin teaches a full image backup. Page 3, lines 10-13. Appellant respectfully traverses this characterization. As taught by Appellant in paragraphs [0003] and [0004] of the Specification,

> [0003] Generally, conventional backup methods provide for either file-by-file backup or image backup. In a file-by-file backup, the backup program copies one file at a time from the disk to the tape. Specifically, the program places all pieces of data for each file, irrespective of actual locations on the disk, into a single sequential block that is stored on the tape. Thus, a file-by-file backup can easily provide an incremental backup, wherein only those files that have been modified or added since the last backup are written to tape. However, a file-by-file backup fails to ensure that all changes to the files are noted. Specifically, the file-by-file backup fails to indicate removes (wherein a file has actually been deleted), renames (wherein the file is renamed), or links (wherein a file, such as an email, includes pointers to other files, e.g. other mail boxes). It also can be slow since files are written to tape in file order not disk order.

> [0004] In an image backup, the data image is read sequentially from the disk and written to the tape. Because disk order (not file order) is used, an image backup can be significantly faster than a file-by-file backup. Image backups have most often been used for full backups only. Image incremental backups exist today but are based on block-change lists. That is, an additional software layer must be used at the file system layer or at the device driver layer that tracks changes to underlying storage on a per block basis. Typically, when a portion of a file is re-written, the data can be written directly over the old data.

This distinction is also known and accepted in the industry. For example, Liu (U.S. Patent 6,415,300)(cited in a previous Office Action) teaches in col. 1, lines 14-30:

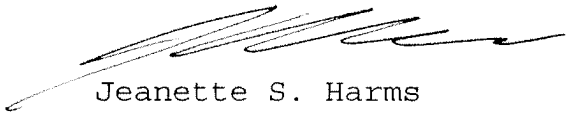
> Prior art backup methods generally provide for an "image" backup of an entire disk volume, or a "file-by-file" backup. An image backup copies the entire disk volume without regard to directory structure, and can be performed relatively quickly, although it does require time and space to copy the entire disk. However, since an image backup generally does not take account of directory and file information, such a backup does not support selective restoration of files. In order to be able to restore files selectively, generally a file-by-file backup has been required.
>
> Conventionally, the files to be backed up in a file-by-file backup are accessed in accordance in the normal manner provided by the operating system, in which data is read from the disk in the logical order of file contents. The actual physical blocks of data on the disk corresponding to each file are not, however, generally stored in a contiguous or linear order.

Based on the above reasons, Appellant traverses the Examiner's characterization that a full file backup is functionally equivalent to an image file.

B. CONCLUSION

For the foregoing reasons, it is submitted that the Examiner's rejections of Claims 1-24 are erroneous, and reversal of these rejections is respectfully requested.

Respectfully submitted,



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Reg. No. 35,537

VIII. CLAIMS APPENDIX

1. (Previously Amended) A method for backing up data in a computer system from at least one primary data source to a secondary data source, the method comprising:

performing a full image backup in disk order on a plurality of data blocks stored by the at least one primary data source;

initiating an incremental backup at a predetermined interval, the incremental backup including file system metadata; and

comparing a modification time of each file/folder at the predetermined interval to a defined time, the file system metadata including each modification time, wherein if the modification time is earlier than the defined time, then excluding data blocks of that file/folder from the incremental backup.

2. (Original) The method of Claim 1, wherein the defined time is a time when the full image backup was performed.

3. (Original) The method of Claim 1, wherein the defined time is a time when a last incremental backup was performed.

4. (Original) The method of Claim 1, wherein the defined time is one of a first time when the full image backup was performed and a second time when a last incremental backup was performed, whichever is the more recent.

5. (Original) The method of Claim 1, further including determining whether a system clock has been changed.

6. (Original) The method of Claim 5, wherein if the system clock has been changed, then returning to performing the full image backup on the plurality of data blocks.

7. (Original) The method of Claim 6, wherein if the system clock has not been changed, then initiating the incremental backup at the predetermined interval.

8. (Original) The method of Claim 6, wherein if the system clock has not been changed, then comparing the modification time of each file/folder at the predetermined interval to the defined time.

9. (Previously Amended) The method of Claim 1, wherein the file system metadata allows the tracking of new, changed, renamed, and linked files/folders.

10. (Original) The method of Claim 1, wherein the full backup and the incremental backup are used to provide a point-in-time disaster recovery.

11. (Original) The method of Claim 1, wherein the full image backup and the incremental backup are used to keep a standby machine up-to-date as of a last backup.

12. (Original) The method of Claim 1, wherein the full image backup and the incremental backup are written directly over a network to a standby machine and recovered, thereby keeping the standby machine up-to-date as of a last backup.

13. (Previously Amended) A method for backing up data in a computer system from at least one primary data source to a secondary data source, the method comprising:

performing a full image backup in disk order on a plurality of data blocks stored by the at least one primary data source;

initiating an incremental backup at a predetermined interval, the incremental backup including file system metadata; and

comparing a modification time of each file/folder at the predetermined interval to a defined time, the file system metadata including each modification time, wherein if the modification time is later than the defined time, then including data blocks of that file/folder in the incremental backup.

14. (Original) The method of Claim 13, wherein the defined time is a time when the full image backup was performed.

15. (Original) The method of Claim 13, wherein the defined time is a time when a last incremental backup was performed.

16. (Original) The method of Claim 13, wherein the defined time is one of a first time when the full image backup was performed and a second time when a last incremental backup was performed, whichever is the more recent.

17. (Original) The method of Claim 13, further including determining whether a system clock has been changed.

18. (Original) The method of Claim 17, wherein if the system clock has been changed, then returning to performing the full image backup on the plurality of data blocks.

19. (Original) The method of Claim 18, wherein if the system clock has not been changed, then initiating the incremental backup at the predetermined interval.

20. (Original) The method of Claim 18, wherein if the system clock has not been changed, then comparing the modification time of each file/folder at the predetermined interval to the defined time.

21. (Previously Amended) The method of Claim 13, wherein the file system metadata allows the tracking of new, changed, renamed, and linked files/folders.

22. (Original) The method of Claim 13, wherein the full backup and the incremental backup are used to provide a point-in-time disaster recovery.

23. (Original) The method of Claim 13, wherein the full image backup and the incremental backup are used to keep a standby machine up-to-date as of a last backup.

24. (Original) The method of Claim 13, wherein the full image backup and the incremental backup are written directly over a network to a standby machine and recovered, thereby keeping the standby machine up-to-date as of a last backup.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.